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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/074,145	02/12/2002	Herbert Bruder	P02,0056	6626

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SCHIFF HARDIN, LLP  
PATENT DEPARTMENT  
6600 SEARS TOWER  
CHICAGO, IL 60606-6473

EXAMINER
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TABATABAI, ABOLFAZL

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/074,145 ✓

Applicant(s)

BRUDER ET AL.

Examiner

Abolfazl Tabatabai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 11-16, 18 and 28-33 is/are rejected.
- 7) ☒ Claim(s) 2-10, 17, 19-27 and 34 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ✓ 1) ☒ Notice of References Cited (PTO-892)
- ✓ 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ✓ 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/22/02.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### **Claim Rejections - 35 USC § 103**

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (U S 5,625,660) in view of Ning (U S 6,504,892).

Regarding claim 1, Tuy discloses a method for computed tomography comprising the steps of:

a) scanning a subject with a conical radiation beam emanating (figs. 1a; 1b, elemen 12; column 3, lines 60-67; column 4, lines 31-40) from a focus of a radiation source and detecting radiation attenuated by said subject with a matrix detector array

while moving the focus relative to the subject on a spiral path around a system axis (column 2, lines 47-55 and column 9, lines 45-55), said detector array supplying output data corresponding to the detected radiation (column 4, lines 49-61).

However, Tuy is silent about the specific details regarding the step of:

b) reconstructing images having an inclined image plane from output data supplied during the movement of the focus on a spiral segment, the image planes of said images being inclined by an inclination angle  $\gamma$  around a first axis intersecting the system axis at a right angle and also being inclined by a tilt angle  $\delta$  with respect to the system axis around a second axis that intersects the first axis and the system axis at a right angle.

In the same field of endeavor (computed tomography) however, Ning discloses system and method for cone beam volume computed tomography using circle-plus-multiple-arc orbit comprising the step of:

b) reconstructing images having an inclined image plane from output data supplied during the movement of the focus on a spiral segment (column 4, lines 59-65 and column 11, lines 60-67), the image planes of said images being inclined by an inclination angle  $\gamma$  around a first axis intersecting the system axis at a right angle and also being inclined by a tilt angle  $\delta$  with respect to the system axis around a second axis that intersects the first axis and the system axis at a right angle (column 13, lines 44-67 and column 14, lines 1-6).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use spiral scanning as taught by Ning in the system of Tuy

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because Ning provides an improved system which has the following characteristics and advantageous. A flat panel detector can be used. This system requires a much shorter volume scanning time relative to helical CT, also can improve acquisition efficiency by a factor of 25 for 1 mm slice thickness per volume scan vs. This system can more efficiently use x-ray tube output and greatly reduce the tube loading requirement.

Regarding claim 18 Tuy discloses a computed tomography apparatus for computed tomography comprising the steps of:

a scanner having a radiation source and a matrix detector scanning a subject with a conical radiation beam emanating (figs. 1a; 1b, element 12; column 3, lines 60-67; column 4, lines 31-40) from a focus of said radiation source and detecting radiation attenuated by said subject with said detector array while moving the focus relative to the subject on a spiral path around a system axis (column 2, lines 47-55 and column 9, lines 45-55), said detector array supplying output data corresponding to the detected radiation(column 4, lines 49-61).

However, Tuy is silent about the specific details regarding the step of:

a computer supplied with said output data for reconstructing images having an inclined image plane from said output data supplied during the movement of the focus on a spiral segment, the image planes of said images being inclined by an inclination angle  $\gamma$  around a first axis intersecting the system axis at a right angle and also being inclined by a tilt angle  $\delta$  with respect to the system axis around a second axis that intersects the first axis and the system axis at a right angle.

In the same field of endeavor (computed tomography) however, Ning discloses system and method for cone beam volume computed tomography using circle-plus-multiple-arc orbit comprising the step of:

a computer supplied (fig. 7 element 724) with said output data for reconstructing images having an inclined image plane from said output data supplied during the movement of the focus on a spiral segment (column 4, lines 59-65 and column 11, lines 60-67), the image planes of said images being inclined by an inclination angle  $\gamma$  around a first axis intersecting the system axis at a right angle and also being inclined by a tilt angle  $\delta$  with respect to the system axis around a second axis that intersects the first axis and the system axis at a right angle (column 13, lines 44-67 and column 14, lines 1-6).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use spiral scanning as taught by Ning in the system of Tuy because Ning provides an improved system which has the following characteristics and advantageous. A flat panel detector can be used. This system requires a much shorter volume scanning time relative to helical CT, also can improve acquisition efficiency by a factor of 25 for 1 mm slice thickness per volume scan vs. This system can more efficiently use x-ray tube output and greatly reduce the tube loading requirement.

3. Claims 11-16, and 28-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (U S 5,625,660) and Ning (U S 6,504,892) as applied to claims 1 and 18 above and further in view of Larson et al (U S 5,802,134).

Regarding claim 11, Tuy and Ning are silent about the specific details regarding

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a method as claimed in claim 1, comprising combining at least some of the plurality of images having inclined image plane to form a transverse tomogram having a transverse slice intersecting the system axis at a right angle.

In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises combining at least some of the plurality of images having inclined image plane to form a transverse tomogram having a transverse slice intersecting the system axis at a right angle (column 8, lines 44-50).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use spiral scanning as taught by Larson in the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Regarding claim 12, Tuy and Ning are silent about the specific details regarding a method as claimed in claim 11, comprising combining the plurality of images with inclined image plane to form said transverse tomogram by interpolation.

In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises comprising combining the plurality of images with inclined image plane to form said transverse tomogram by interpolation (column 14, lines 43-46).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use transverse tomogram by interpolation as taught by Larson in

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the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Regarding claim 13, Tuy and Ning are silent about the specific details regarding a method as claimed in claim 11, comprising combining the plurality of images with inclined image plane to form said transverse tomogram by forming an average. In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises combining the plurality of images with inclined image plane to form said transverse tomogram by forming an average (column 16, lines 36-45).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use forming an average as taught by Larson in the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Regarding claim 14, Tuy and Ning are silent about the specific details regarding a method as claimed in claim 13, comprising combining the plurality of images with inclined image plane to form said transverse tomogram by weighted averaging. In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises combining the plurality of images with inclined image plane to form said transverse tomogram by weighted averaging (column 14, lines 58-65).

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It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use weighted averaging as taught by Larson in the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Regarding claim 15, Tuy and Ning are silent about the specific details regarding a method as claimed in claim 11, comprising selecting images among the plurality of images with inclined image plane for combining for generating said transverse tomogram according to a desired slice thickness of the transverse slice.

In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises selecting images among the plurality of images with inclined image plane for combining for generating said transverse tomogram according to a desired slice thickness of the transverse slice (column 11, lines 19-29).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use slice thickness of the transverse slice as taught by Larson in the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Regarding claim 16, Tuy and Ning are silent about the specific details regarding a method as claimed in claim 15, comprising selecting said images among the images with inclined image plane having a smallest possible slice thickness.

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In the same field of endeavor (computed tomography) however, Larson discloses nutating slice CT image reconstruction apparatus and method comprises selecting said images among the images with inclined image plane having a smallest possible slice thickness (column 11, lines 19-29).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use smallest possible slice thickness as taught by Larson in the system of Tuy because Larson provides an improved system which relates to computed tomography imaging and more particularly to three-dimensional CT imaging with improved efficiency and reduced image artifacts.

Claim 28 is similarly analyzed as claim 11 above.

Claim 29 is similarly analyzed as claim 12 above.

Claim 30 is similarly analyzed as claim 13 above.

Claim 31 is similarly analyzed as claim 14 above.

Claim 32 is similarly analyzed as claim 15 above.

Claim 33 is similarly analyzed as claim 16 above.

### **Allowable Subject Matter**

4. Claims 2-10, 17, 19-27 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### **Other Prior Art**

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Grangeat et al (U S 5,408,511) disclose process for reconstruction of 3D images of an object by measurements using a conical radiation and a bidimensional detector array.

Frenudlich et al (U S 6,178,220 B1) disclose CT systems with oblique image planes.

Sembritzki et al (U S 6,408,044 B2) discloses method for generating a resultant tomogram from a number of tomograms registered with a CT apparatus.

Nakamura et al (U S 6,426,987 B2) disclose imaging system and method of constructing image using the system.

### **Contact Information**

6. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to ABOLFAZL TABATABAI whose telephone number is (571) 272-7458.

The Examiner can normally be reached on Monday through Friday from 9:30 a.m. to 7:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mehta Bhavesh M, can be reached at (571) 272-7453. The fax phone number for organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Abolfazl Tabatabai

Patent Examiner

Group Art Unit 2625

June 15, 2005

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